



SAFE WORK PRACTICES ASSOCIATED WITH THE CUT STONE AND STONE PRODUCT INDUSTRIES

UTAH OCCUPATIONAL SAFETY AND HEALTH

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Safety and health hazards associated with the cut stone and stone product industries
Due to serious accidents and fatalities associated with granite and marble fabricating shops a fact sheet

containing safety and health guidelines is presented below for employer and employees in these workplaces. The process of unloading, lifting and fabrication of the stone slabs create hazards that needs to be addressed by the employer for the protection of its employees. Safety and health issues typically encountered in stone fabricating are listed below:

1. Safe handling practices for granite/marble and other natural stone slabs
2. Exposure to silica dust during cutting, grinding, and buffing natural stone
3. Controls
4. Personal Protective equipment
5. Proper work practices
6. Safe forklift operations
7. Crane safety
8. Electricals
9. Medical exams
10. Air Monitoring
11. Hazard communication

Safe handling practices for granite/marble and other natural stone slabs

Employers should develop, implement, and enforce a comprehensive safety program that includes, but is not limited to, established procedures for safe transfer of heavy materials and employee training in the recognition and avoidance of unsafe conditions and in safe materials handling.

The employer must develop written procedures to address all of the hazards of moving large stone slabs, to include the following:

- Description of the “Danger Zone” where there is a potential for a person to be crushed if a stone or crate of stones were to fall, including handling of individual stone slabs in the yard, in placing them in and taking them out of the A-frame storage racks, in moving them and handling them in the shop, and moving the stone products on job sites where they will be installed.
- Safe handling procedures for removing stones and crates of stones from shipping containers, to include work procedures to ensure that no employee is in the “Danger Zone”, unless the stone slabs are fully supported to prevent them from tipping and falling.
- Work procedures to ensure that the shipping containers and the trailer are fully supported and braced to prevent the container and trailer from moving while stones and containers are being removed from the shipping container.
- Work practices to be observed by the employees to ensure that no employees enter the “ Danger Zone” until the stones and crates are fully supported to prevent them from tipping, by mechanical means.

Use proper lifting devices such as self locking slab trolley, slab lifting squeeze clamp etc. for lifting slabs out of the storage containers.

Moving: Jib-booms can be used when the stone slabs are required to be moved. If space permits position the A-frames with the stone slabs to allow forklift enough room to approach the slabs directly from the side. An alternative method would be to use an overhead crane to move the slabs onto a dolly, eliminating the need for a forklift in this area.

Storage: A storage system should securely hold the stone slabs to prevent them from falling over while offering easy access to each slab. One possibility is to replace the A-frames with a W-frame that would catch a falling slab within the framework. (see figure 1). Another method is to design a racking system

where each slab is held in an individual slot (see Figure 2). These types of frames must be strong enough to withstand the weight of the falling slabs, and precautions need to be taken as they may present a pinch-point hazard if an employee has his hand caught between the frame and the stone.

Securing: This can be accomplished by the use of heavy nylon straps to wrap and secure the stone slabs to the A-frames.

Employers should conduct a job hazard analysis of all work activities with the participation of the workers.

Employers should be aware of educational and training resources for health and safety information.

Employers should ensure that loads are suitably secured against displacement with a material restraining system.

If A-frames are used, ensure that they have been connected to each other to improve structural integrity and bolted to the flatbed surface to prevent movement.

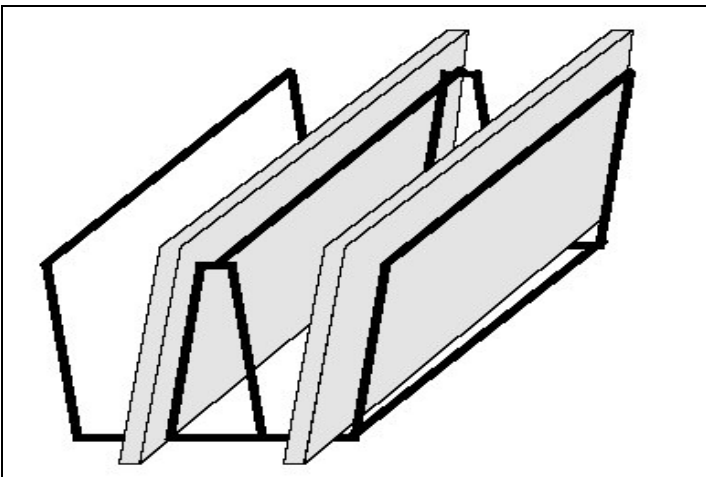


Figure 1: W-frame

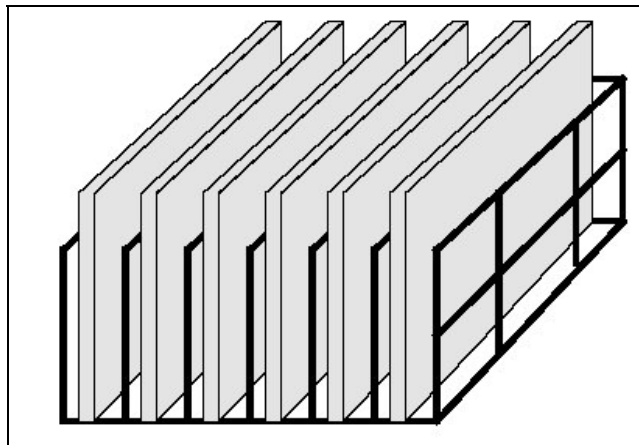
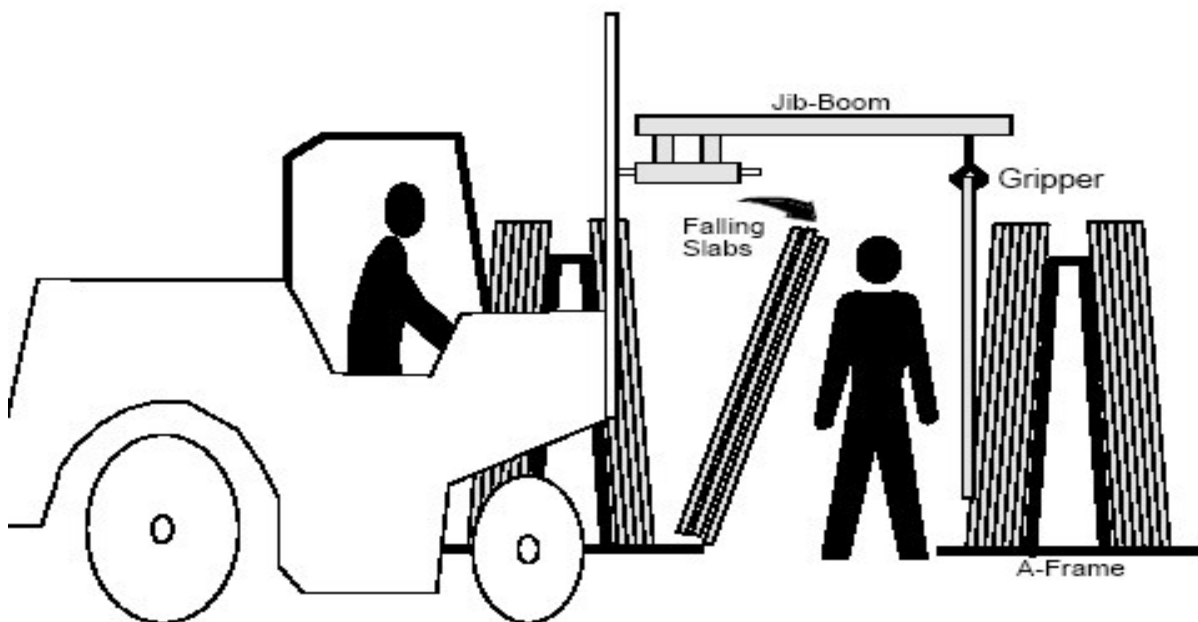


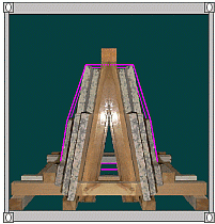
Figure2: Slab rack

A recent case

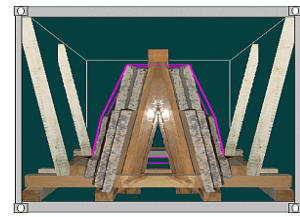
Five employees were receiving a shipping cargo container of stone products. The cargo container was mounted on a standard trailer frame. Each crate contained 10 granite slabs, each weighing about 700 lbs. Two crates were on the left side of the trailer, one on the right side. The forklift was too small to lift these crates. So, the workers decided to try to move one slab at a time manually from the back of the box on the right side of the trailer. When the five workers tried to move the third slab, which had a crack in it, the slab broke and the remaining 6 slabs fell over onto the workers. Two of the workers were knocked out of the way, three were pinned by the slabs against the two crates of slabs on the left side of the trailer. The two uninjured workers tried to lift the slabs upright one at a time, but after moving several, the stack fell over again, causing the bottom slab to shatter into large pieces. The two business owners required treatment at a local hospital, one employee died at the scene.



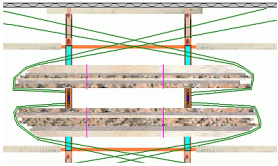
Worker crushed by stone slab falling off a A-frame



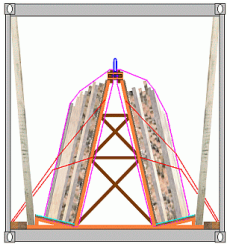
Transverse securing with strapping



Securing against vertical and tipping movement using shoring



The direct lashings are attached to lashing points at the tops of the A-frames, pass forwards round the protruding sections of the slabs and are tightened on the opposite side. Since the slabs are very fragile, the lashings must be only slightly pretensioned. The cross beams of the A-frames which slope obliquely upwards and outwards are covered with friction-enhancing material, so that the majority of the longitudinal forces are eliminated by friction with the floor.



The slabs may be secured transversely and vertically to the frames prior to loading. To this end, strapping is tensioned around each slab and frame half. In the container, the frames are secured against lateral and longitudinal shifting with squared lumber. Shoring prevents the frames from moving vertically and tipping. Direct lashing is used to prevent any lengthwise movement of the slabs.

(Reference: http://www.containerhandbuch.de/chb_e/stra/index.html?/chb_e/stra/stra_04_02_06.html)

Exposure to silica dust during cutting, grinding, and buffing natural stone

Silica dust exposure is of major concern during cutting and grinding on granite and marble slabs. When workers inhale crystalline silica, the lung develops scar tissue around the silica particles. This process results in a lung disease known

as silicosis. As more lung tissue is damaged by silica dust, breathing becomes more difficult, chest pain occurs, and death may result. Silicosis patients suffer shortness of breath, fever, and cyanosis. Some patients are diagnosed incorrectly as having pulmonary edema, pneumonia, or other lung diseases. Though silicosis is not known to cause any other diseases it may be aggravated by other conditions. Emphysema and asbestosis can cause an additive crippling effect on the lungs when coupled with silicosis, as can cigarette smoking. Needless to say, people with these known lung conditions should not be exposed to silica dust.



The three types of silicosis are as follows:

- ✓ Chronic silicosis, which occurs after 10 or more years of exposure to low concentrations of crystalline silica.
- ✓ *Accelerated silicosis*, which occurs 5 to 10 years after exposure to high concentrations of crystalline silica.
- ✓ Acute silicosis, which occurs a few weeks to 5 years after exposure to very high concentrations of crystalline silica.

Controls

Dust control methods: Hand-held saws and grinders are used in to cut or shape slabs. The cutting action generates high levels of respirable dust which often contains a high respirable crystalline silica content.

- ✓ Reduce exposure to respirable silica by dust suppression techniques or local exhaust ventilation. Exhaust ventilated tools which remove the dust at source, and tools fitted with a water supply for dust suppression, are widely available. Capturing or controlling the dust at source is nearly always better than attempting to control exposure by ventilating the whole area.
- ✓ Dust collectors: Follow manufacturers guidelines for its maintenance and use respirators when emptying the dust collector
- ✓ Remove dust from equipment with a water hose instead of compressed air. Use vacuums with HEPA filters. Use wet sweeping instead of dry sweeping.

Personal Protective Equipment

Power tools present more hazards than hand tools due to the speed at which they operate. Although similarities exist, there are distinct differences between the PPE suggested for use with hand tools and the PPE recommended for safe power tool use.

- ✓ **Eye and face protection:** safety glasses or goggles, is especially important when using power tools. The speed in which drills, saws, grinders, sanders and routers operate can propel small particles much faster and farther than do hand tools. Others working around the area where power tools are used should also wear protective eyewear. Eye and face protection shall comply with ANSI Z87.1-1989.
- ✓ **Hand Protection:** Standard cotton or leather work gloves can protect your hands from minor scrapes and cuts while working with various materials. The best way to prevent injury from moving parts is to keep your hands on the tool's handles and keep all guards in place. Anti-vibration gloves minimize the vibration created by hammerdrills and rotary hammerdrills.
- ✓ **Foot Protection:** Safety footwear is recommended when using power tools because power tools are heavy and they can cut. Safety shoes with a nonslip, insulated sole and a steel toe protect against dropped objects and misdirected electricity. Protective footwear shall comply with the ANSI standard "USA Standard for Men's Safety-Toe Footwear," Z41.1-1967.
- ✓ Along with PPE, **proper attire** is also important while using power tools. Avoid loose clothing to avoid being caught in moving blades. Long hair should be tied back or covered for the same reason; remove all jewelry as well.
- ✓ **Hearing protection:** Noise levels during cutting or grinding on marble and granite can range between 85 to more than 100 dBA. If the 8-hour time weighted average for noise exceeds 85 dBA (action level), the employer must implement a hearing conservation program. Elements of a hearing

conservation program will include the following elements:

- ▶ Monitoring
- ▶ Annual audiograms.
- ▶ Employee training on use of hearing protection.

✓ **Respiratory Protection**

Appropriate respiratory protection equipment and programs should be provided whenever engineering controls and work practices cannot keep concentrations of airborne silica at or below safe limits.

- ▶ The minimum respiratory protection for a worker who is working with crystalline silica dust, may be an N95 NIOSH-approved respirator. However, the exposure to crystalline silica must not exceed the assigned protection factor of the respirator. Respirators are a good option as protective equipment, but they should be used only when controls (such as substitution, automation, enclosed systems, and local exhaust ventilation) cannot keep exposures at or below safe limits.
- ▶ Respiratory Protection Program—To make sure that respirators are used properly, the employer must establish a comprehensive respiratory protection program. The following are important elements of this standard:
 - ▶ Periodic air monitoring
 - ▶ Regular training of workers in respirator use
 - ▶ Selection of proper NIOSH-approved respirators
 - ▶ A medical determination of the worker's ability to perform the work while using a respirator
 - ▶ Respirator fit testing
 - ▶ Maintenance, inspection, cleaning, and storage of respirators
 - ▶ The respiratory protection program should be evaluated regularly by the employer.

Proper Work Practices

Portable power tools are designed for a wide variety of uses. Circular saws, jigsaws, drills, hammerdrills, sanders, grinders, routers and numerous other power tools save us time and effort on the job. The following safety rules are common to all power tools. In addition, each type of tool has its own unique hazards which must be taken into account.

- ✓ Read the tool's owner's manual to understand the tool's proper applications, limitations, operation and hazards.
- ✓ Use pneumatic tools instead of electrical ones due to the presence of water used with the tools.
- ✓ Do not use electric power tools in the proximity of flammable vapors, dusts or construction materials. Also avoid using electric power tools in wet environments.
- ✓ Protect yourself from electric shock by insuring that your tools are properly grounded; use a Ground Fault Circuit Interrupter for corded tools. Always check for hidden wires that may contact bladed tools.
- ✓ Select a tool based on the task it is designed to do. Only use attachments specifically recommended for your power tools, and ensure their proper installation.

- ✓ Never remove guards from tools
- ✓ For abrasive wheels, ensure the wheel is rated for use at the tool's RPM rating.
- ✓ Inspect tools for damage including the cord, correct alignment, binding of components, or any condition that would effect the operation of the tool. If a tool is damaged, or a condition develops while a tool is in use, have the tool fixed before putting it back into service.
- ✓ Avoid excessive force to make cutting tools cut faster. Feed material only as fast as the tool is designed to accept to prevent excessive wear and decreased control.
- ✓ Keep others away from the work area, or provide shields to stop flying debris and other distractions.
- ✓ Always maintain tool control by keeping a tight grip on a tool. Also maintain your balance and do not overreach. Do not operate a power tool if you are under the influence of medications or alcohol, or if you are tired or distracted.
- ✓ Secure your work in a vise or clamp for increased stability. Use the tool's side handle, if available, for better control.
- ✓ Verify that all tools are unplugged or that the power source is removed when changing blades, performing maintenance or when tools are not in use. Be sure adjustment knobs are tightened and remove any adjustment keys before use.
- ✓ Keep tools in a secure location when not in use.
- ✓ Avoid unintentional tool start up by keeping your finger off of the power switch.
- ✓ Depending on the level of dust generated, showering and changing into clean clothing before leaving work, and avoiding smoking, eating, and drinking in dusty areas. (The above information on work practices was borrowed from Labsafety.com)

Safe forklift operation

It is a violation of Federal law for anyone under 18 years of age to operate a forklift or anyone over 18 years of age who is not properly trained and certified to do so.

- ✓ Make sure that workers do not operate a forklift unless they have been trained and certified by the employer
- ✓ Develop, implement, and enforce a comprehensive written safety program that includes worker training, operator licensure, and a timetable for reviewing and revising the program. A comprehensive training program is important for preventing injury and death. Operator training should address factors that affect the stability of a forklift—such as the weight and symmetry of the load, the speed at which the forklift is traveling, operating surface, tire pressure, and driving behavior.
- ✓ Ensure that operator restraint systems are being used on sit-down type forklifts.
- ✓ Establish a vehicle inspection and maintenance program.
- ✓ Retrofit old sit-down type forklifts with an operator restraint system if possible.
- ✓ Do not handle loads that are heavier than the rated weight capacity of the forklift.
- ✓ Use properly tuned propane forklifts to avoid exposure to carbon monoxide.
- ✓ OSHA requires that industrial trucks be examined before being placed in service. They shall not be

placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. When industrial trucks are used around the clock, they shall be examined after each shift. When defects are found, they shall be immediately reported and corrected [29 CFR 1910.178(q)(7)].

Crane Safety

Cranes used for lifting granite and marble slabs must be inspected prior to initial use.

- ✓ Frequent inspection - Daily to monthly intervals.
- ✓ Periodic inspection - 1 to 12-month intervals.
- ✓ Develop a crane inspection checklist to include various parts of the crane
- ✓ such as hooks, hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations.
- ✓ Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain, hooks and ropes which were inspected.

For more information on crane safety go to <http://www.labsafety.com/refinfo/ezfacts/ezf107.htm> - **Crane Safety**

Electricals

Employees using sanding and cutting tools with water supply are at greater danger of electrocution. Use electrical powered tools with ground fault circuit interruptors (GFCI) to prevent these types of accidents.

For more information go to:

<http://www.labsafety.com/refinfo/ezfacts/ezf264.htm> - **GFCI**

Use and care of insulated tools:

- ✓ Keep tools clean and dry
- ✓ Inspect insulation prior to each use
- ✓ If you doubt the integrity of the insulation, destroy the tool or have it re-tested
- ✓ Follow the manufacturer's temperature recommendations for use
- ✓ Have a qualified person inspect and re-certify tools annually for safe use
- ✓ Use other personal protective equipment as necessary

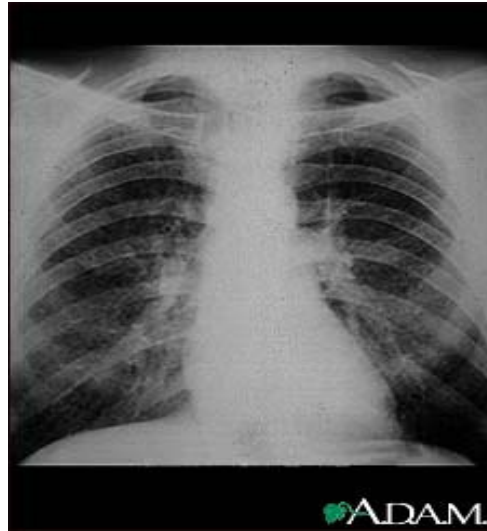


Medical exams

Medical exams should be offered to all workers who may be exposed to respirable particles of silica. Each exam includes a job history, a medical history, and a physical exam. The job history questionnaire asks about all the jobs the worker has had, all the materials worked with, and all protective equipment used. These exams should occur before job placement or entry into a

trade. Workers should continue to have follow-up medical evaluations as well as careful monitoring of their work and exposures. NIOSH provides a list of doctors certified in interpreting X-rays and silicosis diagnosis.

For more information go to: <http://www.cdc.gov/niosh/readstat.html>



Air monitoring

Establish effective programs for monitoring the exposure of workers to crystalline silica dust. Conduct air monitoring to measure worker exposure and check that controls are working properly. OSHA regulates silica exposure using the permissible exposure limit (PEL), which is the maximum amount of airborne dust an employee may be exposed to during a full work shift.

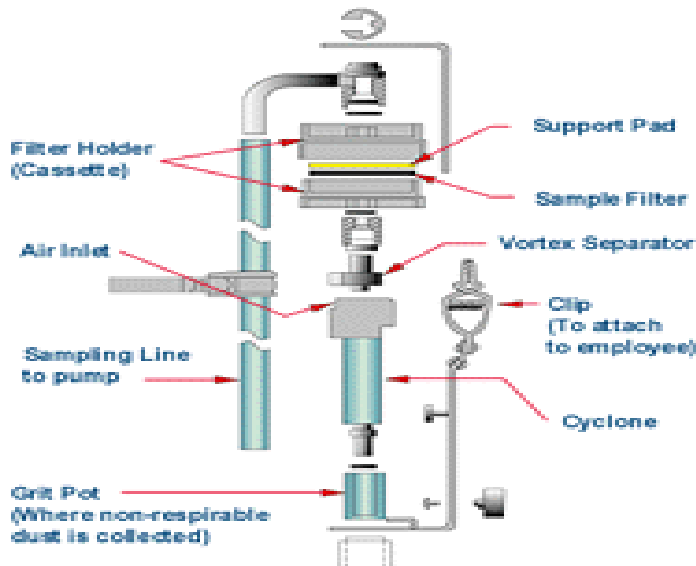
PEL Equations

$$\text{PEL (respirable fraction)} = 10 \div [\% \text{ quartz} + (\% \text{ cristobalite} \times 2) + (\% \text{ tridymite} \times 2) + 2]$$

The cyclone assembly and sampling pump will be placed on an employee, who will wear the device throughout the work shift for up to 8 hours.

- All employees may be fitted with the sampling device or just a select few who are closest to the silica source may be fitted. The industrial hygienist can help you determine what will be most appropriate.
- The hygienist will return at the end of the sampling period to de-activate the sampling pump and remove the filters to be sent for analysis.

Sampler's Note: For Dorr-Oliver nylon cyclones, the flowrate must be maintained near 1.7 liters/minute to efficiently collect the respirable fraction. Any leaks will cause a negative error.



Cyclone Assembly



Hazard communication

- ✓ Post warning signs to mark the boundaries of work areas that may be contaminated with respirable crystalline silica.
- ✓ Provide workers with material safety data sheets (MSDSs) for silica, masonry products, alternative abrasives, and other hazardous materials to which they may be exposed.
- ✓ Provide workers with information about safe handling, labeling, and storage of toxic materials.
- ✓ Write all signs, labels, instructions, and other material for workers in easy-to-read English and in any other languages needed for workers' understanding of the material.

Workplace Safety & Health Consultation Services

FREE !!!

No-Charge Service to Utah Businesses...

Our Program is available at no charge to any business with one or more employees throughout the State. We give priority, however, to small business employers in high hazard industries.

Step #1 - Request

You may call (801) 530-6855 or fax# (801) 530-6992 and advise us of your interest.

Step #2 - On-Site Visit

A date and time will be set for an on-site visit. The visit begins with an opening conference, continues with a walk-through safety and health program assessment (complete or partial) and a closing discussion.

Step #3 - Evaluation and Report

Following the visit, we will evaluate all collected information and relevant research conducted. If we take samples, research will include laboratory analysis. We will send you a report detailing all findings and recommendations, including ways to improve your safety and health program.

Step #4 - Correction of Serious Hazards

The report you receive will discuss all potential hazards, serious or other than serious. You must correct the serious hazards to continue in the program. You and the consultant agree to a date to correct serious hazards. Additional consultation visits during this period are available, as needed, to help you maintain a safe and healthful working environment for your employees.

A Total Service that Includes:

- Safety and health program assessment technical assistance
- A walk-through safety and health survey
- Employer-employee training
- Ventilation system evaluation
- Evaluation of electrical systems and equipment
- Review of machine guarding
- Noise measurements
- Assistance with personal protective equipment
- Air sampling and analysis
- Comprehensive written reports

revised October 1998